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Introduction to the study of Virginia fisheries

Virginia Fisheries Laboratory

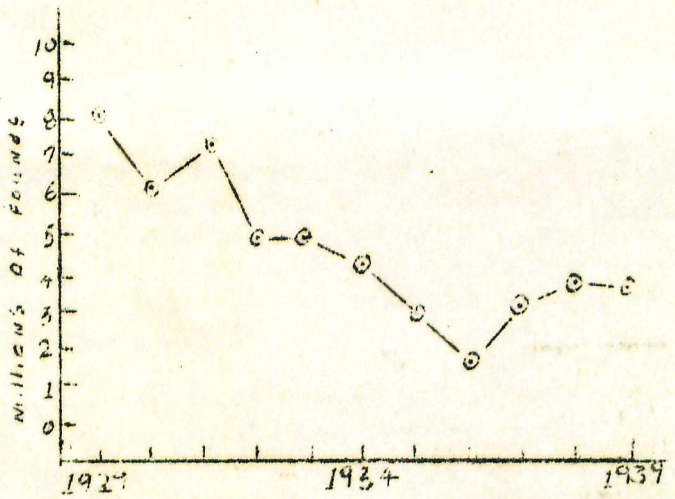
Educational Series on Aquatic Biology*

of the

Virginia Fisheries Laboratory

INTRODUCTION TO THE STUDY OF VIRGINIA FISHERIES**

There has been a marked decline in the catches of many of our important Virginia Fisheries including shad, striped bass or rock, sheepshead, oyster, scallop, and blue crab. The shad fishery is an outstanding example having undergone a reduction of over 50% during the period 1929-1939. The production level of crab during the past ten years has been over 40% less than the 1910-1915 level.



What should be done to restore and maintain these commercial fisheries?

In the case of a particular animal answers to certain questions are needed. How many are there? Are they present throughout all the year or just during certain seasons? How long do they live? What is their age when they first mature enough to produce young? What is their rate of growth? In the case of aquatic organisms that are used for food, we need to know if there are sufficient numbers to satisfy our commercial needs. If the supply is decreasing we want to know: firstly, why it is declining; secondly, what can be done to conserve the present supply; and thirdly, how can the present fishery be regulated so as to assure a more abundant supply for the future. In order to answer these questions more facts on the biology of these animals are necessary. We need to know how they are affected by local conditions. Fishery conservation implied maximum utilization of a fishery assuring its preservation for the future. Let us consider briefly the "Biology of the Oyster" and the "Biology of the Crab".

Biology of the Oyster

In the late spring when the water temperature rises to about 70° Fahrenheit, male and female oysters throw out their spawn--sperms and eggs--which have been developing in the reproductive organs. Each oyster produces millions of microscopic sperms or eggs which are carried in the water by currents. A single sperm unites with a single egg, a process known as fertilization, after which the egg divides many times forming an embryo that consists of a clump of cells, partly covered with fine, rapid-moving, hair-like processes called cilia which propel the oyster embryo through the water. Soon the young oyster becomes encased in a shell and at the end of the first day it is a swimming larva, in which the outer covering of cilia has been lost and the organ of locomotion lies within

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** Teachers may have the Series mimeographed so as to provide copies for each student.

the shell. As the larva swims this swimming organ comes out from between the halves of the shell, and tows the larva along much as an airplane propellor tows the airplane. After swimming about for approximately two weeks, the microscopic larval oyster goes to the bottom and becomes permanently attached to some object. A cement is secreted from a gland and hardens quickly so that the left shell of the oyster adheres firmly. After becoming attached the young oyster is called a "spat."

The larval oyster may become attached to a variety of hard surfaces, but it prefers clean oyster shells, free of mud and slimy growth of small organisms. Rapid growth follows attachment, sometimes at the rate of 1/2 to 3/4 inch per month. Oysters ranging from "spat" sizes up to two or three inches in length are known as "seed". They are sometimes transplanted from one body of water to another. In Virginia waters oysters are mature enough to reproduce at the age of one or two years. During the second winter of their life, they may reach legal size, that is, three inches in length. Oysters measuring over nine inches in length are occasionally found. Oysters are collected by means of hand tongs, patent tongs, and dredges. Their enemies include drills (snails) and starfish. The snail bores a small hole through the shell and sucks up the meat. This wound causes the oyster to relax its muscle separating the shells and exposing the animal within to the depredations of crabs and fishes. The starfish opens an oyster by enclosing it with its arms or rays that are provided with rows of sucker-like, tube feet on the lower surface and exerting a constant outward pull on the two shells until they open. Another enemy of the oyster is the boring sponge, yellow in color, that bores in the shell, forming small tunnels in which it lives. The shell is gradually honeycombed and the oyster is weakened from its effort to seal up the openings leading to the inside of the shell.

This seafood is marketed as "canned oysters", "raw oysters" i.e. with the shell removed, and "shell stock" i.e. oysters in the shell. The shells are ground for chicken food and agricultural lime. Whole shells are planted to provide a suitable surface for the attachment of larval oysters. During 1939, the Virginia oyster catch amounted to over 16 million pounds, about 3 3/4 million bushels, valued at over 1 1/3 million dollars.

Bivalves related to the Oyster

There are two kinds of clams and one mussel of commercial value in the Chesapeake Bay. Clams--maninose and hard-shelled clams--are, next to the oyster, the most extensively used bivalves on the Atlantic coast. Like the oyster, they derive their food from the water in the form of microscopic plants and animals called plankton. They possess a tube-like muscle called siphon, having two canals, the water being drawn in through one expelled through the other. Their early development resembles that of the oyster. At the end of eight or ten days, the free swimming larval clam or mussel settles to the bottom, fastens itself to sand grains, shells, rocks or sea weeds by means of a horny thread which, in the case of the mussel, remains throughout life, but is soon lost by the clam that now burrows in the soil. Attention is called to the exhibits of clam and oyster shells of various sizes, and also, to the two kinds of Virginia mussels--the ribbed mussel and the sea mussel. Over 1/3 million bushels of hard-shelled clams were taken in 1939, valued at about $300,000.

The Biology of the Blue Crab

The blue crab is related to the lobster and the crayfish. It migrates up and down the Chesapeake Bay to and from waters of lesser salinity. Its migratory habits are determined by releasing crabs after inserting a tag in their shells. The crabber returns the tag to the laboratory. A female crab is known to have traveled a distance of 65 miles in 34 hours. Those who have visited a crab house on the Bay in summer have seen a conspicuous yellow mass attached to the "apron" or abdomen of the crab. This crab is called a "sponge crab" and the spongy mass is composed of about 2 million eggs. When the eggs are ripe the crab releases

them into the water. The free swimming larval crab is known at first as a zoea. It transforms into a megalops, then into a "first crab" stage resembling the adult crab in shape. As the crab grows it sheds its outer hard shell (peeler crab) and the inside soft tissue layer in contact with the water expands and hardens forming a new shell. By this process of shedding or moulting the crab grows, and finally, after successive shedding, reaches maturity. During this time the crab is moving up the Bay toward fresher water. It reaches maturity in the upper less saline waters of the Chesapeake and its tributaries during the following summer. At this time the male and female crabs mate, the males remaining for the most part in the upper Bay while the females move to the lower Bay hibernating during the cold winter months and being ready to spawn the following spring and summer at an age of about two years. Some of these spawned females are considered to live through a third winter. Male crabs may reach an age of three years.

The facts bearing on the life history of the blue crab show that they breed in Virginia waters and grow to maturity in the upper Bay waters. In Chesapeake Bay the catching of the immature soft crabs--peeler crab fishery--is, therefore, largely centered in Maryland waters. How may these facts on life history help us to regulate the fishery so as to avoid depletion? The catching of "sponge" crabs that bear thousands of potential crabs in the form of eggs tends to reduce the producing capacity of Virginia waters, the Bay's breeding ground. Likewise, the taking during early fall in Maryland waters of mature hard crabs that have mated in the upper waters of the Bay and are migrating south in order to spawn the following spring, is likewise destructive. Here is an illustration of the need for an intelligent regulation on the catch aiming to protect enough crabs for an adequate spawning reserve to maintain the fishery and at the same time not to deprive the crab fishermen of a profitable catch. Attention is called to the Laboratory exhibit showing larval crabs, peeler crabs, buster crabs, sponge crabs, male and female crabs, picture of crab floats and a model of a crab pound. About 30 million pounds of crabs (around 92 million crabs) valued at nearly $700,000 were taken in Virginia waters during 1939.

What is being done to improve the condition of the Virginia Fisheries?

The Virginia Commission of Fisheries is the department of the state government that collects information on the several fisheries and, carefully determining the time and amount of fishing, it endeavors to prevent over-fishing and to regulate the fisheries in the best interests of conservation. Production is increased by transplanting clams to favorable areas for growth and by planting mature oysters on depleted oyster beds to supply spawn and shells of different kinds to provide surfaces for the attachment of larval oysters. The College of William and Mary trains students for conducting fishery investigations. Through an educational program, an effort is made to familiarize the high school students of the State with the life that exists in our natural waters and with the information they need in order to do their share toward its preservation. These institutions have established the Virginia Fisheries Laboratory at Yorktown where field and laboratory experiments are conducted on local forms to get information on their biology which the industry may use in the interests of conservation and increased production. Summer courses are offered so that state biology teachers may work on the biology and conservation of aquatic organisms in tidewater Virginia, particularly those of commercial value.

These institutions can provide information and guidance with respect to the several fisheries, they can establish regulatory laws but it is, in large measure, only the individual that can assure their application and successful practice. Each student has a responsibility to assume, an important part to play in helping to re-establish and maintain our fishery resources that are now in danger of depletion.